

CLAIMS

1. A method for controlling an output frequency of a laser, said method comprising:
passing optical energy from an output of said laser to an optical component
having a frequency-selective response characteristic;
measuring response of said optical component having said frequency-selective
response characteristic to said optical energy from said laser output using exactly one
photodetector; and
controlling said laser output frequency based on said measured response and not
on measurements from photodetectors other than said exactly one photodetector.
2. The method of claim 1 wherein controlling said laser output frequency comprises:
generating an error signal based on a difference between a measured laser output
frequency and a desired laser output frequency; and
generating a control signal for said laser output frequency based on a sum of said
error signal and a dithering signal.
3. The method of claim 2 wherein generating an error signal comprises:
sampling said measured response at a first sampling time during a period that said
dithering signal causes an upward fluctuation in said laser output frequency;
sampling said measured response at a second sampling time during a period that
said dithering signal causes a downward fluctuation in said laser output frequency; and
developing said error signal based on a difference between samples recorded at
said first sampling time and said second sampling time.

4. The method of claim 1 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

5. The method of claim 1 wherein controlling said laser frequency based on said measured response comprises:

if said measured response indicates said laser output frequency is outside a tracking range, sweeping a control signal until said laser output frequency is within said tracking range.

6. A method for controlling an output frequency of a laser, said method comprising:
passing optical energy from an output of said laser to an optical component having a frequency-selective response characteristic;

measuring response of said optical component having said frequency-selective response characteristic to said optical energy from said laser output;

generating a dithering signal to dither said output frequency of said laser; and
controlling said laser output frequency based on said measured response as influenced by said dithering signal.

7. The method of claim 6 wherein controlling said laser output frequency comprises:
generating an error signal based on a difference between a measured laser output frequency and a desired laser output frequency; and

generating a control signal for said laser output frequency based on said error signal and said dithering signal.

8. The method of claim 7 wherein generating an error signal comprises:
sampling said measured response at a first sampling time during a period that said dithering signal causes an upward fluctuation in said laser output frequency;
sampling said measured response at a second sampling time during a period that said dithering signal causes a downward fluctuation in said laser output frequency; and
developing said error signal based on a difference between samples recorded at said first sampling time and said second sampling time.

9. The method of claim 6 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

10. The method of claim 6 wherein controlling said laser frequency based on said measured response comprises:
if said measured response indicates said laser output frequency is outside a tracking range, sweeping a control signal until said laser output frequency is within said tracking range.

11. The method of claim 6 wherein said dithering signal comprises a square wave.

12. Apparatus for controlling an output frequency of a laser, said apparatus comprising:

an optical component having a frequency-selective response characteristic, said optical component receiving optical energy from said laser;

exactly one photodetector that measures response of said optical component having said frequency-selective response characteristic to said optical energy from said laser output; and

a control block that controls said laser output frequency based on said measured response.

13. The apparatus of claim 12 wherein said control block comprises:

an error signal generator that generates an error signal based on a difference between a measured laser output frequency and a desired laser output frequency; and

a control signal generator that generates a control signal for said laser output frequency based on said error signal and a dithering signal.

14. The apparatus of claim 13 wherein said error signal generator samples said measured response at a first sampling time during a period that said dithering signal causes an upward fluctuation in said laser output frequency, samples said measured response at a second sampling time during a period that said dithering signal causes a downward fluctuation in said laser output frequency, and develops said error signal based on a difference between samples recorded at said first sampling time and said second sampling time.

15. The apparatus of claim 12 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

16. The apparatus of claim 12 wherein said control block comprises:

a sweep generator that, if said measured response indicates said laser output frequency is outside a tracking range, sweeps a control signal until said laser output frequency is within a tracking range.

17. Apparatus for controlling an output frequency of a laser, said apparatus comprising:

an optical component having a frequency-selective response characteristic that receives optical energy from said laser;

a photodetector that measures response of said optical component having said frequency-selective response characteristic to said optical energy from said laser;

a dithering signal generator that dithers said output frequency of said laser; and

a control block that controls said laser output frequency based on said measured response as influenced by said dithering signal.

18. The apparatus of claim 17 wherein said control block comprises:

an error signal generator that generates an error signal based on a difference between a measured laser output frequency and a desired laser output frequency; and

1
a control signal generator that generates a control signal for said laser output frequency based on said error signal and said dithering signal.

19. The apparatus of claim 18 wherein said error signal generator samples said measured response at a first sampling time during a period that said dithering signal causes an upward fluctuation in said laser output frequency, samples said measured response at a second sampling time during a period that said dithering signal causes a downward fluctuation in said laser output frequency, and develops said error signal based on a difference between samples recorded at said first sampling time and said second sampling time.

20. The apparatus of claim 17 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

21. The apparatus of claim 17 wherein said control block comprises:
a sweep generator that, if said measured response indicates said laser output frequency is outside a tracking range, sweeps a control signal until said laser output frequency is within said tracking range.

22. The method of claim 17 wherein said dithering signal comprises a square wave.

23. Apparatus for controlling an output frequency of a laser, said apparatus comprising:

means for passing optical energy from an output of said laser to an optical component having a frequency-selective response characteristic;

means for measuring response of said optical component having said frequency-selective response characteristic to said optical energy from said laser output using exactly one photodetector; and

means for controlling said laser output frequency based on said measured response.

24. The apparatus of claim 23 wherein said controlling means comprises:

means for generating an error signal based on a difference between a measured laser output frequency and a desired laser output frequency; and

means for generating a control signal for said laser output frequency based on a sum of said error signal and a dithering signal.

25. The apparatus of claim 24 wherein said means for generating an error signal comprises:

means for sampling said measured response at a first sampling time during a period that said dithering signal causes an upward fluctuation in said laser output frequency;

means for sampling said measured response at a second sampling time during a period that said dithering signal causes a downward fluctuation in said laser output frequency; and

means for developing said error signal based on a difference between samples recorded at said first sampling time and said second sampling time.

26. The apparatus of claim 23 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

27. The apparatus of claim 23 wherein said means for controlling said laser frequency based on said measured response comprises:

means for, if said measured response indicates said laser output frequency is outside a tracking range, sweeping a control signal until said laser output frequency is within said tracking range.

28. Apparatus for controlling an output frequency of a laser, said apparatus comprising:

means for passing optical energy from an output of said laser to an optical component having a frequency-selective response characteristic;

means for measuring response of said optical component having said frequency-selective response characteristic to said optical energy from said laser output;

means for generating a dithering signal to dither said output frequency of said laser; and

means for controlling said laser output frequency based on said measured response as influenced by said dithering signal.

29. The apparatus of claim 28 wherein said means for controlling said laser output frequency comprises:

means for generating an error signal based on a difference between a measured laser output frequency and a desired laser output frequency; and

means for generating a control signal for said laser output frequency based on said error signal and said dithering signal.

30. The apparatus of claim 29 wherein said means for generating an error signal comprises:

means for sampling said measured response at a first sampling time during a period that said dithering signal causes an upward fluctuation in said laser output frequency;

means for sampling said measured response at a second sampling time during a period that said dithering signal causes a downward fluctuation in said laser output frequency; and

means for developing said error signal based on a difference between samples recorded at said first sampling time and said second sampling time.

31. The apparatus of claim 28 wherein said optical component having a frequency-selective response characteristic comprises a fiber Bragg grating having a notch frequency substantially equivalent to a desired output frequency of said laser.

32. The apparatus of claim 28 wherein said means for controlling said laser frequency based on said measured response comprises:

means for, if said measured response indicates said laser output frequency is outside a tracking range, sweeping a control signal until said laser output frequency is within said tracking range.

33. The apparatus of claim 28 wherein said dithering signal comprises a square wave.